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INTRO--IN WHICH A SMART TERMINAL TEACHES ITS OWN USE
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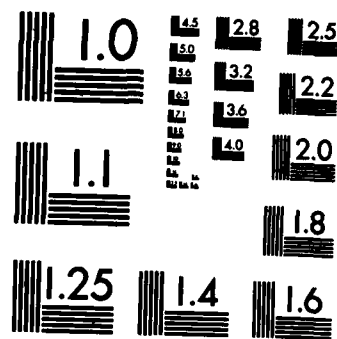
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**INTRO - In Which A Smart Terminal
Teaches Its Own Use**

or

**An Instructional Scheme for
Novice PADS Users**

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March 1973

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for public release.**

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ABSTRACT

The use of processor aided display stations (PADS) can be facilitated, especially for novice users, by incorporating on-line instructional aids under control of the station processor. In MITRE's PADS laboratory an interactive display sequence called INTRO provides such guidance, teaching beginners how to use the station keyboard and lightgun in conjunction with the Sanders 720 display. This report describes the INTRO scheme and presents performance data from six people who used the scheme for training during the recent PADS test program.



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INTRO - AN INSTRUCTIONAL SCHEME FOR NOVICE PADS USERS

INTRODUCTION

The use of processor aided display stations (PADS) can be facilitated, especially for novice users, by incorporating on-line instructional aids under control of the system processor. In MITRE's PADS laboratory an interactive display sequence called INTRO[†] teaches beginners how to use the station keyboard and lightgun in conjunction with the Sanders 720 display. The PADS user station is shown in Figure 1. The Sanders keyboard was modified for use with this station. A facsimile of the keyboard used by novices is shown in Figure 2.

The INTRO scheme is designed to give novice users experience and confidence in their ability to interact with the computer before they encounter job-related schemes. It teaches the particular characteristics of the keyboard and the lightgun which are needed to use other schemes. There is no attempt in INTRO to teach display formatting; furthermore, an effort is made to avoid technical terms which are not of interest to a novice and which might be confusing to him.

INTRO has been used by many visitors to the PADS laboratory. This study is concerned with its use by six operators in preparation for their

[†] The scheme described in this document is a revision of an earlier scheme described by N. C. Goodwin and S. L. Smith.

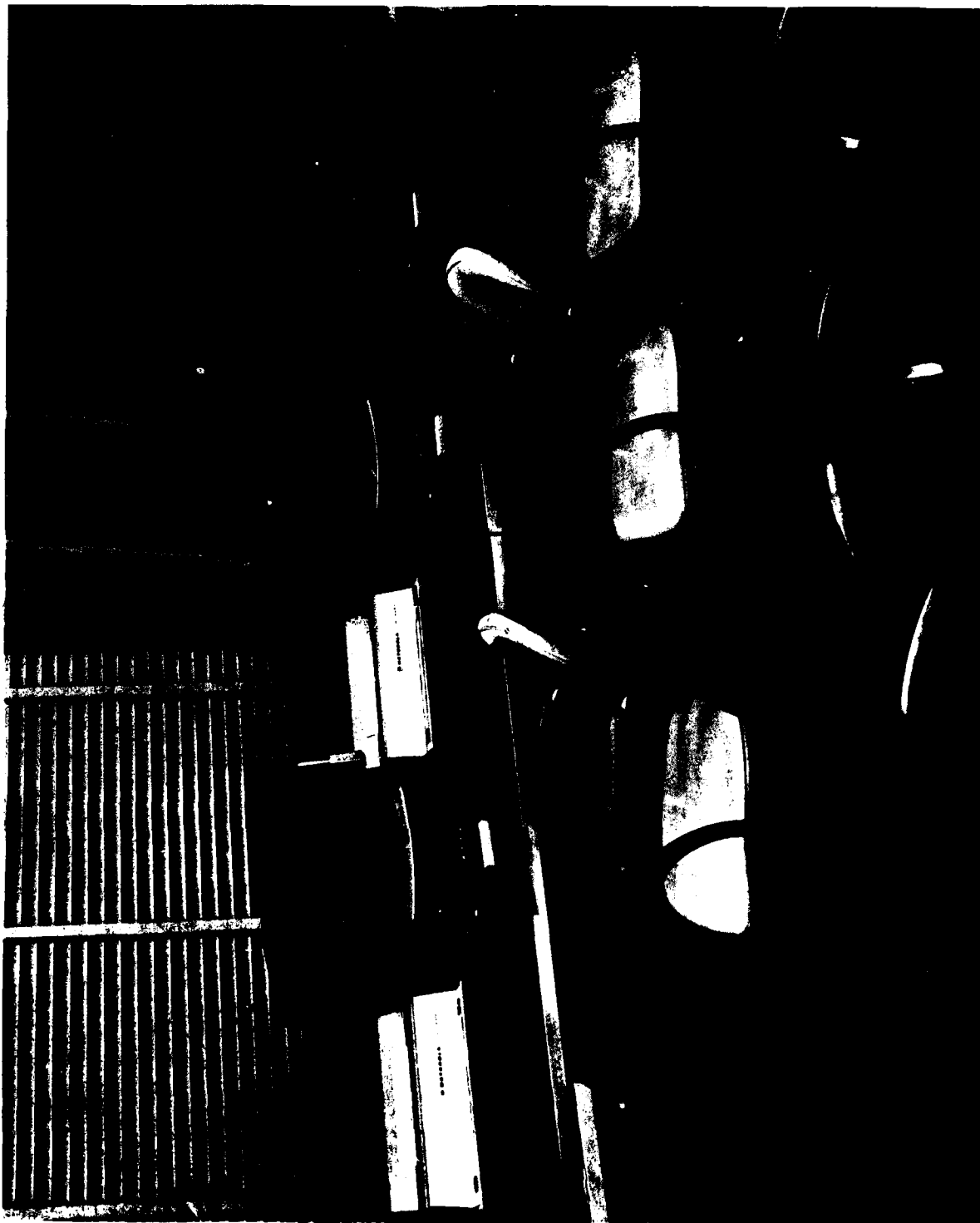


Figure 1. PADS User Station

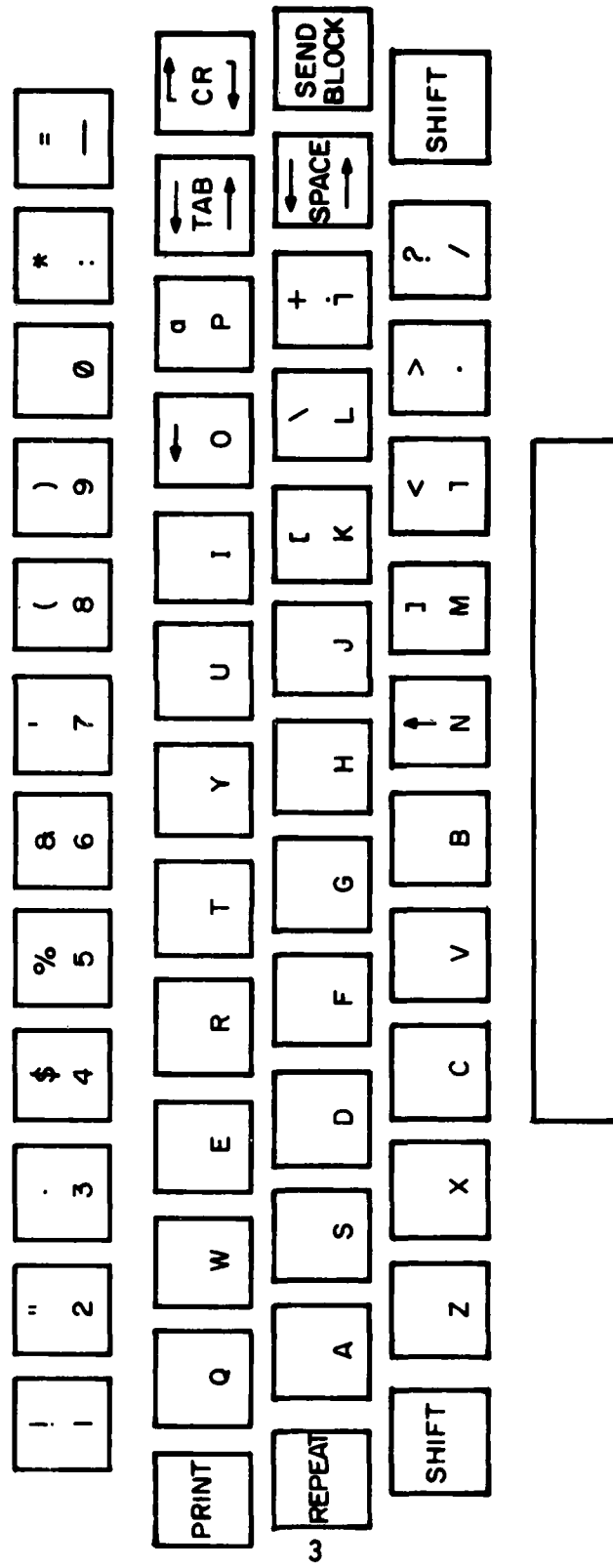


Figure 2 - Keyboard Layout

participation in the recent PADS test program.[†] A data recording capability, implemented for the test series, was used to automatically record each action an operator took, plus the time of the action. These data were then analyzed to determine the amount of time spent on various parts of INTRO, and the errors made. These data are discussed in the second part of the document.

The first part of this document contains a frame by frame description of INTRO. Facsimile displays are presented, and the principles and problems relating to each frame are discussed.

WHAT INTRO SAYS, AND WHY

The INTRO scheme consists of a series of textual display frames (shown on pages 10 - 18 of this document). Each frame describes a characteristic of keyboard or lightgun use, or offers the user a chance to practice his skills.

INTRO was constructed according to a consistent scheme format. A scheme is a series of displays whose use is mediated by lightgun labels or control options. A control option may result in an entirely new display, addition of material to a display, or manipulation of data presented on the display.

In INTRO, control options are identified by a plus sign (+). The standard options for sequencing through the scheme appear at the top of each display frame, where they are easily seen and lightgunned. The title of the

[†] ESD-TR-74-55 Vol 1 PADS Test Program: 1 Test Design and Procedures, S. L. Smith, N. C. Goodwin, S. R. Harper, January 1973. AD917981

scheme also appears here. Lines two and four are blank. Line three is set aside for error messages. The text of each display frame begins on line five.

The Sanders 720 display can be operated in two basic modes: TYPE and FORMAT. The FORMAT mode allows an expert operator to create displays. The TYPE mode allows an operator to type onto the display, but not to change the basic display format. Some of the keys on the keyboard have different functions, depending on the display mode. The mode can be under computer control. In INTRO the operator is only allowed to be in the TYPE mode and the functions of the keys are explained in this context only.

The basic unit for formatting a display is called a "block". Each control option is a separate block, so the novice is taught about control options rather than blocks. To select a control option, it is necessary for the operator to place the cursor on any character in the label. The cursor can be moved from character to character using the lightgun. When the cursor is placed on the correct option, the operator must "send" the option to the computer for processing. To do this, he pushes a key labeled SEND BLOCK, on the keyboard.

In this scheme, the only error the operator can make is to push the SEND button when the cursor is not on a control option. Such an action results in the following error message:

*** ONLY WORDS AFTER A '+' ARE RECOGNIZED; TRY AGAIN**

If a second error is made immediately after the first, a different message is presented:

*** INPUT NOT RECOGNIZED: PLEASE TRY AGAIN**

Each message is preceded by an asterisk which blinks at a rate of three cycles per second. This blinking asterisk serves to call attention to the error message.

Two different error messages are presented for sequential errors. There is always a change in the display as the result of any input. The messages describe the problem: an unrecognizable input; and suggest a solution: try again with a word preceded by a '+'.
o

The use of INTRO is self-paced. The only thing the operator must do to complete the scheme sequence is to place the cursor on the control option STEP, and then send the option, on each frame. The term 'cursor' and the SEND BLOCK key are explained on the first frame of the scheme. The frame is presented with the cursor placed immediately after the "P" in +STEP. The operator has only to identify the cursor and to find the SEND BLOCK key to reach the next frame.

It is not always possible, or desirable, to predict where the operator will want the cursor to be. He may want to make data entries before requesting a new display. The second frame of INTRO teaches the operator how to use the lightgun to position the cursor; he is invited to practice moving the cursor around the display. A new label is presented: BACKUP. This label enables one to retrieve the previously displayed frame. It is not explicitly explained in the scheme; it is hoped the operator will try it without prompting.

Not all control options in a scheme result in an entirely new display. On the third frame the concept of control options is explained. As each POEM label is sent a line of a poem is added to the display next to that label. The basic display does not change.

On the fourth frame signs of the zodiac are control options. Unlike the rather cryptic POEM labels on the previous display, the operator knows what kind of data he will receive in response to each option. Also, each sign does not have a unique data entry area on the display. Instead, the data for one sign will replace that for another as each option is sent.

The novice has been using the lightgun to move the cursor, and to select control options which change the display. On the next frame of INTRO the novice is taught the simplest aspect of keyboard use: space and shift-space. These keys enable an operator to move the cursor around a display without changing the display. A special dotted area is provided; the display is presented with the cursor at the beginning of this area. The cursor is confined to this area, which is a separate block from the text, as long as the operator is using the keyboard. He can move the cursor from the area only by lightgun actions.

Two similar cursor moving keys on the keyboard have different functions. The space key moves the cursor without changing the display. The space bar moves the cursor, but replaces characters with blanks as it does so. The difference between these keys is described on the sixth frame of the scheme. The novice is encouraged to practice, since this distinction is a common source of confusion to operators unfamiliar with the keyboard.

On the next two frames (7, 8) the repeat key and the carriage return key are described. The operator is offered a chance to practice.

The novice operator's opportunity to type on the display is under computer control; he can, therefore, be prevented from typing onto the display. This is demonstrated on the ninth frame.

Three frames (10, 11, 12) provide the operator a chance to practice typing onto the display. The cursor is placed in the dotted area where the novice can practice typing without disturbing the instructions or labels.

The thirteenth frame of INTRO provides the operator with a review of the various cursor-moving keys and a chance for more practice.

The input area so far has been separate from text and labels. The next frame (14) demonstrates that labels and entry areas can be interspersed. As entries are typed in the dotted area the cursor skips past the labels. (This type of display is created by placing the labels in one block, and the entry area in another.)

A puzzle on frame fifteen exposes the novice to a task which can involve a mixture of keyboard and control option entries. In this case the operator does not have to know the answers; he can get them by sending in the options. However, one can imagine that in response to the options, further clues might be given. Or, in a more serious job setting, this technique could be used to provide code tables, explanations of required data entries, etc., on a display with limited free space.

To bring the introductory sequence to a close, the novice is offered a chance to enter his name on a "diploma". This diploma (and all other displays) can be printed by simply pushing a key labeled PRINT on the keyboard. A printer adjacent to the display prints whatever is on the display; the display does not change.

The PRINT key and diploma are described on the sixteenth frame. The diploma itself is on the seventeenth frame. Very few operators decline to make and print a diploma.

A final frame of the sequence congratulates the novice for finishing the sequence. This frame can be worded to serve as a bridge between INTRO and any other subsequent scheme of interest.



Frame 1



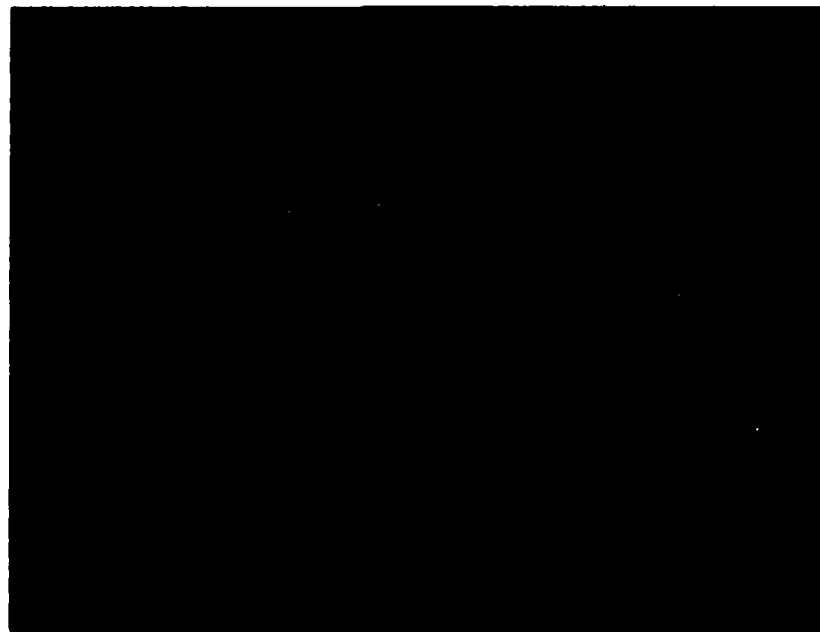
Frame 2



Frame 3



Frame 4



Frame 5



Frame 6



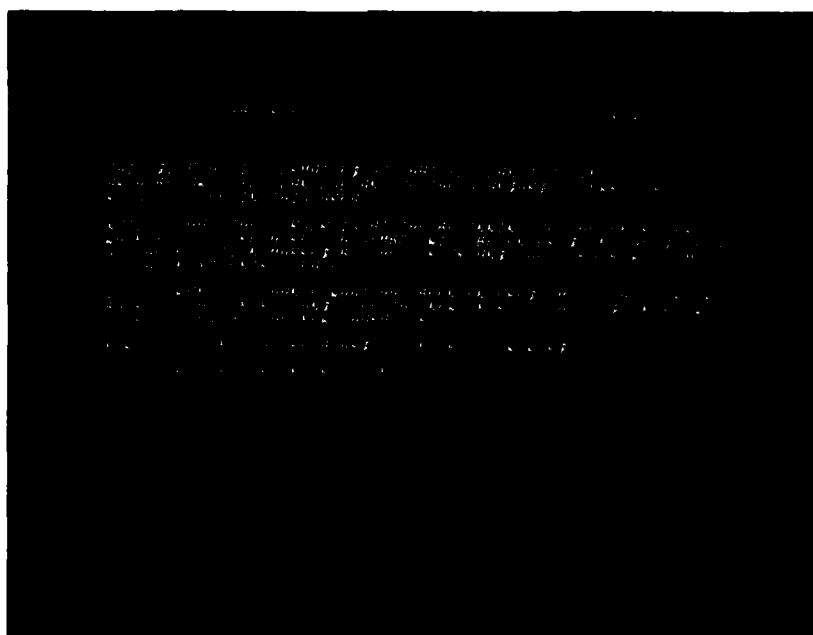
Frame 7



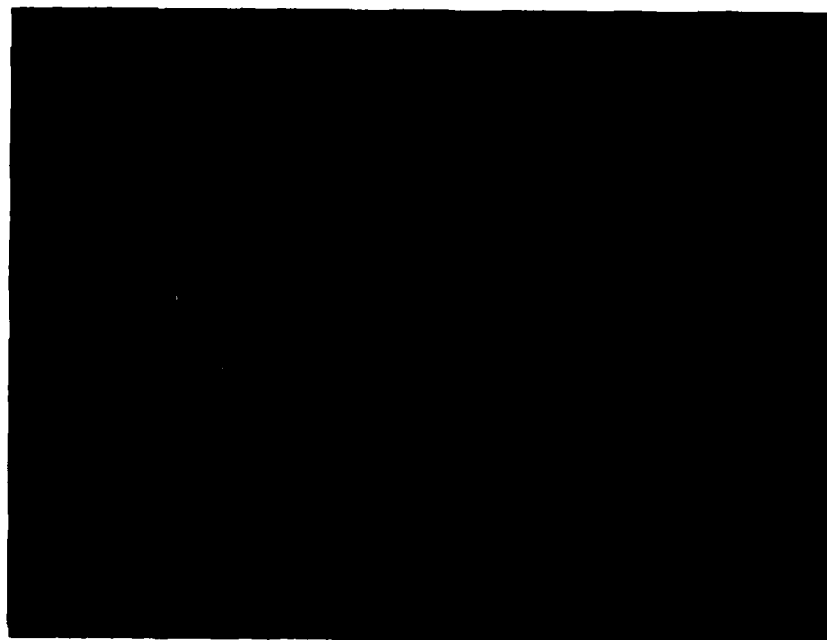
Frame 8



Frame 9



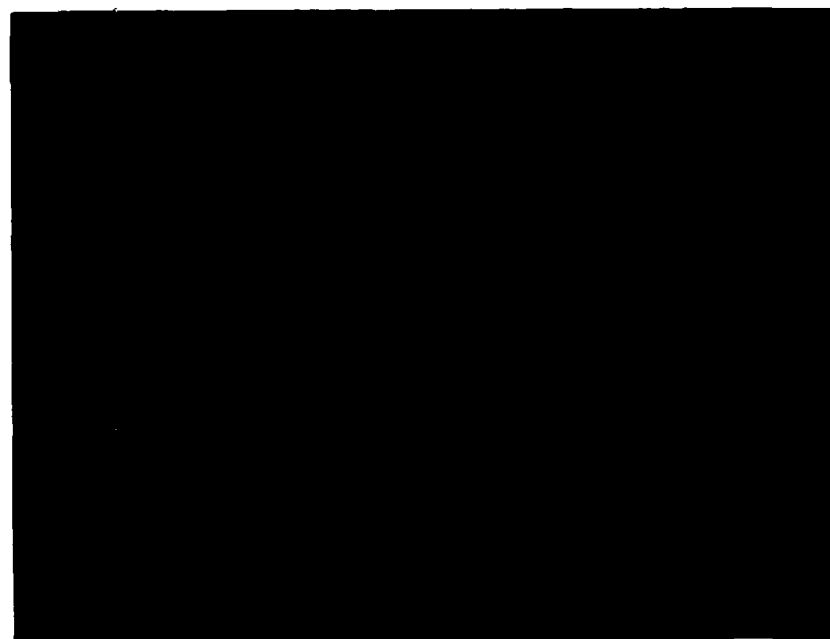
Frame 10



Frame 11



Frame 12



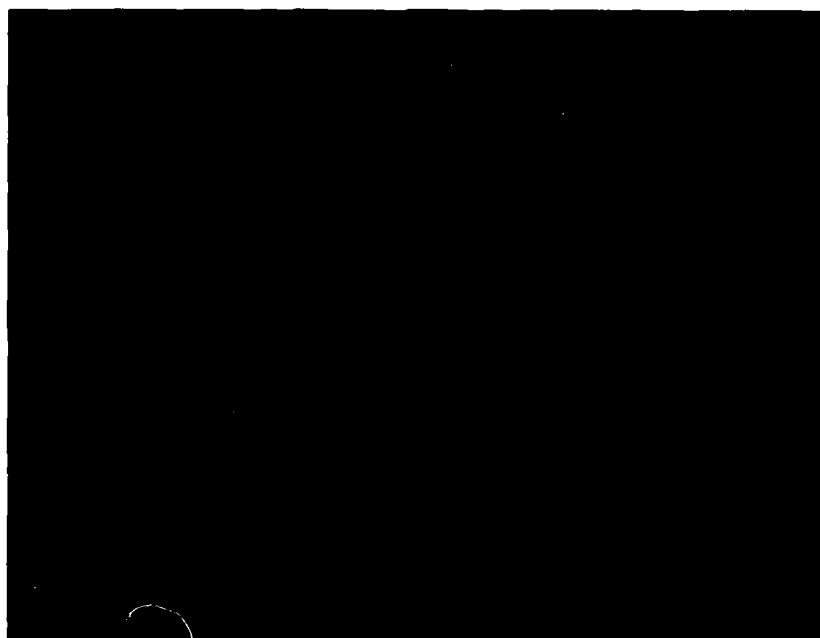
Frame 13



Frame 14



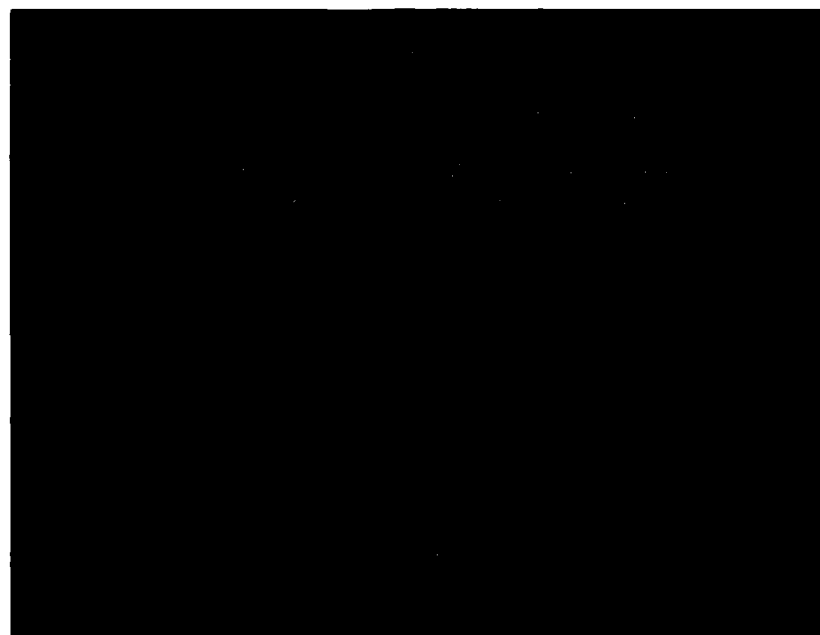
Frame 15



Frame 16



Frame 17



Frame 18

TEST OPERATORS' PERFORMANCE

Six operators participated in the recent PADS test program. None of these operators had previous experience using a Sanders 720 display, keyboard, or lightgun. Each operator used the INTRO scheme to acquire keyboard and lightgun skills, and to become familiar with this display-oriented interactive computer system.

The operators spent from 21 to 38 minutes going through INTRO, with an average time of 29.3 minutes for a complete session. Use of INTRO was self-paced; the operators who spent more time using the scheme spent the time practicing typing and cursor moving, and investigating use of control options; they were not having trouble with the scheme.

Four of the operators used the scheme in pairs. Each operator used an individual display, and went through the scheme at his own pace; however, the computer was time-shared. Because of scheduling difficulties two other operators used INTRO at different times, without time-sharing the computer. The only difference in performance for these two sets of operators was that the computer response was slightly slower for the time-sharing operators. The mean computer processing time for a session, combining data for all operators, was 30 seconds.

Before beginning INTRO, each operator was asked to rate his typing ability. Ratings ranged from fair/poor (3), to good (2), to "excellent for an engineer" (1). The touch of the Sanders keyboard is quite different from that of most typewriters; even the good typists benefited from the practice offered in INTRO.

INTRO was contrived to instruct operators in three basic techniques: typing, cursor moving via keyboard, control options, and lightgun use. The average amount of time the operators spent on each of these techniques, plus other elements of INTRO, is shown in Table I.

The largest block of time, 7.4 minutes, was spent on typing practice. This includes use of the shift key, straightforward typing, and the practice of typing entries into different display formats.

The next largest block of time, 6.8 minutes, was spent practicing use of lightgun and control options. All of the operators requested the entire poem. The number of astrological signs requested varied from two to eleven, with an average of six per operator. The BACKUP option was tried by three operators who used it an average of twice each.

The operators spent an average of five minutes practicing with the cursor moving keys: space, tab, carriage return, etc. An additional 3.3 minutes was spent on the review frame, where these keys and typing were practiced further.

The puzzle, which was designed to show combined control option and keyboard entries, took about 3.4 minutes of the session. Some of the operators tried to complete the puzzle without requesting any answers. One operator succeeded, and then requested an answer just to see how it worked. Two subjects used the control options five times on the puzzle. The average number of control options used was three.

Subjects spent 1.6 minutes on miscellaneous activities - trying the keyboard in the frame when it wouldn't work, reading about the PRINT key, and admiring their diplomas. Much less time, a little over half a minute, was spent in name entering on the diploma.

Table I

Test Operators' Performance
Using INTRO

<u>Type Action</u>	<u>Mean Time (Min.) Spent</u>	<u>Per Cent. of Total</u>
Typing Practice (Frames 10, 11, 12, 14)	7.4	25.4
Lightgun/Control Option Practice (Frames 1, 2, 3, 4, BACKUP)	6.8	23.4
Cursor Moving Keys: Practice (Frames 5, 6, 7, 8)	5.0	17.0
Puzzle (Frame 15)	3.4	11.5
Cursor Moving Keys: Review (Frame 13)	3.3	11.1
Miscellaneous (Frames 9, 16 looking at diploma)	1.6	5.6
Diploma: Name entering (Frame 17)	0.7	2.4
Error Messages	0.6	2.1
Computer Processing	<u>0.5</u>	<u>1.6</u>
Total	29.3	100.1

In their use of INTRO, most of the operators made some errors; i. e., they sent material other than control options. An average of two errors were made per subject, and a little over half a minute per session was spent reacting to error messages. One operator did not make any errors, another made errors four times. Only one subject made two consecutive errors, and thus received the two different error messages.

The availability of an instructional sequence such as INTRO was important to the PADS test series. Use of this scheme ensured that all the test operators would have consistent instruction and equal opportunities to practice using the equipment under computer control prior to their test series.

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